

We claim:

1. A lamp illumination system, comprising:
a plurality of lamps;
5 a plurality of first light reflectors;
a plurality of second light reflectors; and
an output light guide; wherein
each of said plurality of first light reflectors is arranged to reflect light output
from one of said plurality of lamps onto an input of one of said plurality of second
10 light reflectors, each of said plurality of second light reflectors is arranged to direct
light from an output of one of said plurality of first light reflectors into an input of said
output light guide, such that the outputs of each of said plurality of lamps is
combined into a single output.
- 15 2. The system as recited in claim 1, wherein at least one of said plurality of first
light reflectors comprises an elliptical reflector.
3. The system as recited in claim 1, wherein at least one of said plurality of first
light reflectors comprises a dual paraboloid reflector.
- 20 4. The system as recited in claim 1, further comprising a plurality of input light
guides, and wherein each of said plurality of first light reflectors is arranged to reflect
light output from one of said plurality of lamps onto an input of one of said plurality of
input light guides, each of said plurality of second light reflectors is arranged to direct
25 light from an output of one of said plurality of input light guides into an input of said
output light guide, such that the outputs of each of said plurality of light guides is
combined into a single output.
5. The system as recited in claim 4, wherein said plurality of lamps consists of
30 first and second lamps, said plurality of first light reflectors consists of first and
second dual paraboloid reflectors (DPR), said plurality of input light guides consist of
first and second input light guides, and said plurality of second light reflectors consist
of first and second prisms; and

said first and second DPR are arranged to respectively reflect light output from said first and second lamps onto inputs of said first and second input light guides, respectively, and said first and second prisms are arranged to direct light from said first and second input light guides to the input of said output light guide, respectively.

6. The system as recited in claim 5, wherein said first and second prisms are identical 90 degree prisms and are arranged to input an equal amount of light into said output light guide.

7. The system as recited in claim 5, wherein said first and second lamps comprise a same type of lamp.

8. The system as recited in claim 5, wherein said first lamp comprises a different type of lamp than said second lamp.

9. The system as recited in claim 4, wherein said plurality of input light guides comprise tapered light guides.

10. The system as recited in claim 4, wherein said plurality of input light guides comprise straight light guides.

11. The system as recited in claim 5, further comprising first and second retro-reflectors arranged to reflect light from said first and second lamps onto said first and second DNRs, respectively.

12. The system as recited in claim 6, wherein an output side of said first and second prisms each divide the input of said output light guide, equally.

13. The system as recited in claim 5, wherein the input of said output light guide is divided among first and second output sides of said first and second prisms, proportionally based on an arc size of said first and second lamps, respectively.

14. The system as recited in claim 4, wherein said plurality of input light guides comprise triangular input light pipes, said plurality of second light reflectors comprise four-faced prisms, and said output light guide comprises a triangular output light pipe, wherein said four-sided prisms are arranged to reflect light from the input light pipes to the output light pipe.

15. The system as recited in claim 4, wherein said plurality of input light guides comprise five triangular input light pipes, said plurality of second light reflectors comprise five four-faced prisms, and said output light guide comprises a 5-sided output light pipe, wherein said four-sided prisms are arranged to reflect light from the input light pipes to the output light pipe.

16. The system as recited in claim 1, further comprising a plurality of lenses disposed between said plurality of lamps and said plurality of first light reflectors each arranged to focus light output from one of said plurality of lamps onto an input of one of said plurality of second light reflectors.

17. The system as recited in claim 5, wherein gaps are disposed between said first and second input light guides and said first and second prisms, respectively.

18. The system as recited in claim 5, wherein a gaps are disposed between said first and second prisms and said output light guide.

19. The system as recited in claim 17, wherein said gaps are filled with clear epoxy.

20. The system as recited in claim 18, wherein said gaps are filled with clear epoxy.

21. The system as recited in claim 5, wherein there are no gaps between said first and second input light guides and said first and second prisms, respectively.

22. The system as recited in claim 5, wherein there are no gaps between said first and second prisms and said output light guide.

23. A lamp illumination system, comprising:

5 a plurality of dual paraboloid reflector systems;

a plurality of reflectors; and

an output light guide; wherein

each of said plurality of dual paraboloid reflector systems is arranged to generate and focus light onto an input of one of said plurality of reflectors, each of
10 said plurality of reflectors is arranged to direct light from an output of one of said plurality of dual paraboloid reflector systems into an input of said output light guide, such that the outputs of each of said dual paraboloid reflector systems is combined into a single output.

15 24. The system as recited in claim 23, wherein each dual paraboloid reflector system comprises:

a lamp;

retro-reflector; and

a dual paraboloid reflector; wherein

20 said lamp is disposed between said retro-reflector and said dual paraboloid reflector in such a manner as to focus approximately all light output from the lamp into a single output; and

each said single output is focused onto the input of one of said plurality of reflectors.

25 25. The system as recited in claim 24, wherein a first DPR system and a second DPR system of said plurality of DPR systems are arranged such that an output side of said first and second DPR systems faces one another.

30 26. The system as recited in claim 23, further comprising a plurality of input light guides, and wherein each of said plurality of dual paraboloid reflector systems is arranged to generate and focus light onto an input of one of said plurality of input light guides, each of said plurality of reflectors is arranged to direct light from an

output of one of said plurality of input light guides into an input of said output light guide, such that the outputs of each of said plurality of light guides is combined into a single output.

5 27. The system as recited in claim 26, wherein each dual paraboloid reflector system comprises:

a lamp;

retro-reflector; and

a dual paraboloid reflector; wherein

10 said lamp is disposed between said retro-reflector and said dual paraboloid reflector in such a manner as to focus approximately all light output from the lamp into a single output; and

each said single output is focused onto the input of one of said plurality of reflectors.

15 28. The system as recited in claim 27, wherein a first DPR system and a second DPR system of said plurality of DPR systems are arranged such that an output side of said first and second DPR systems faces one another.

20 29. The system as recited in claim 28, wherein a first input light guide of said plurality of input light guides is arranged to receive the light output from said first DPR system, and a second input light guide of said plurality of input light guides is arranged to receive the light output from said second DPR system, said first and second input light guides being parallel to each other and orthogonal to said output
25 light guide.

30 30. The system as recited in claim 29, wherein a first prism of said plurality of reflectors is arranged to receive the light output from said first input light guide, and a second prism of said plurality of reflectors is arranged to receive the light output from said second input light guide, said first and second prisms being arranged adjacent to one another to cover the input area of said output light guide.

31. The system as recited in claim 30, wherein said first and second input light guides are tapered light guides, narrowing from an output side to the input side, said output side of each light guide being approximately a same area as an input side of said first and second prisms, and an output side of each prism having an area
5 approximately equal to one half an area of the input of said output light guide.
32. The system as recited in claim 23, further comprising a plurality of lenses disposed between said plurality of dual paraboloid reflector systems and said plurality of reflectors each arranged to focus light output from one of said plurality of dual
10 paraboloid reflector systems onto an input of one of said plurality of reflectors.
33. The system as recited in claim 30, wherein gaps are disposed between said first and second input light guides and said first and second prisms, respectively.
- 15 34. The system as recited in claim 30, wherein a gaps are disposed between said first and second prisms and said output light guide.
35. The system as recited in claim 33, wherein said gaps are filled with clear epoxy.
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36. The system as recited in claim 34, wherein said gaps are filled with clear epoxy.
37. The system as recited in claim 30, wherein there are no gaps between said
25 first and second input light guides and said first and second prisms, respectively.
38. The system as recited in claim 30, wherein there are no gaps between said first and second prisms and said output light guide.
- 30 39. A lamp illumination system, comprising:
a plurality of light means for producing light;
a plurality of collecting means for collecting and focusing the light from said
each said light means; and

combination means for combining the collected light from said collecting means and combine the collected light into a single output.

40. The system as recited in claim 39, wherein said plurality of collecting means
5 comprise reflector means for reflecting light from said light means onto light guide means for guiding reflected light to said combination means.

41. The system as recited in claim 40, wherein said plurality of combination
10 means comprise reflector means for reflecting light from said light guide means into a single output means for output the combined light from each of the light means.

42. The system as recited in claim 39, wherein said plurality of light means
15 comprise a plurality of dual paraboloid reflector means for generating a single light output.

43. The system as recited in claim 39, wherein said collecting means comprises
reflector means for reflecting light from said light means to said collecting means.

44. The system as recited in claim 39, wherein said collecting means further
20 comprises focusing means for focusing reflecting light from said reflector means to said collecting means.